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ELEPHANT BUTTE IS ASSOIAN OF THE UNITED STATES

Lengthy Article in "The Earth" on Gigantic Project of Reclamation Service on the Rio Grande.

WRITER IS CITIZEN OF NEW MEXICO

Writing under the caption, "The American Assoian," Brigham Leathem, a citizen of Sierra county who has watched the progress of the Elephant Butte project from its very inception, has a long article in "The Earth" of this month. The article says:

The idea of irrigating arid regions, thus rendering productive an otherwise desert land, probably is almost as ancient as the practice of agriculture itself. Undoubtedly when man ceased to be a purely carnivorous animal, roaming the wilds and subsisting entirely upon the products of the hunt, and settled down to the pursuit of agriculture, he occupied areas along the banks of flowing streams, whence he could derive the adequate amount of water for maintaining the soil most effectively with the least labor. Since there seems every reason to suppose that in many places he was dependent entirely upon rivers for water, the rainfall being slight, irrigation was an immediate necessity.

Indian civilization probably began along the Ganges and Indus; the early Romans cultivated the banks of the Tiber, while the agricultural peoples of northern and western Europe first settled along the streams of that continent. But most famous of all was the settlement of the ancient valley of the Nile, and no one fact of historical history is more widely or better known than the progress of agriculture among the ancient Egyptians on their sacred stream.

The flood and fall of the Nile was so necessary to the population that the religious festivals were concurrent with these events, and the action of the river thus became the foundation upon which was erected that wonderful and complicated religious system which later so powerfully influenced the theologies of Greece and Rome and of which many remains are still extant in modern Christianity.

Irrigation from rivers, either copied from Egypt, or arising in spontaneous synchronism among various peoples, was practiced among agricultural communities throughout the ancient world, and was preserved in Europe, despite the ravages of the ruthless

Goths and Vandals, in modern times.

Found It in America.

When the first Spanish adventurer penetrated the interior of the New World, among the numerous other practices they found common to old World peoples was agriculture, fostered by irrigation, and in Mexico they discovered a system carried almost to perfection.

About the middle of the sixteenth century the Spanish conquistadores, pushing northward along the banks of the Rio Bravo del Norte, now called the Rio Grande, found the valley of that stream inhabited by a peaceful agricultural race, occupying well-built towns (pueblos), living in communal organization, and using irrigation systems which undoubtedly originated with their prehistoric ancestors. In all probability, in this region is to be found the oldest cultivated soil of either of the American continents, some scientific authority considering its irrigation to antedate that of the Nile itself, and, although it has been worked for centuries, its character is such that it continuously renewes and always is extremely rich, producing phenomenal crops. Today, in the many valleys of the Rio Grande, may be found fruits and vegetables of such magnitude as to cause astonishment—cabbages weighing from 18 to 24 pounds, cauliflower almost as large and onions tipping the scales at 2½ pounds.

The Spanish colonists readily adopted the irrigation of the natives, and either appropriated the pueblos themselves already constructed, some of which still are in use, or built similar systems in their new settlements, where they continued to follow the Indian methods of agriculture in a desultory manner until the American occupation under General Kearney in 1848. Two years later the treaty of Guadalupe Hidalgo ended the Mexican war and ratified the American conquests of the huge southwestern territories, and American people were at perfect liberty, save for the aggressions of the hostile native tribes, to settle the country and cultivate the soil. Pioneers rapidly entered the region, and soon were followed by bands of settlers. In a short time little communities of farmers were dotted along the valleys of the Rio Grande in Colorado, New Mexico and Texas, all dependent upon its waters to irrigate their lands.

An American Nile.

This beneficial "American Nile," which, with its tributaries, constitutes the principal river system of the southwest, within whose influence the majority of the New Mexican colonization abides, and upon whose waters it is dependent for the irrigation of more than one-half of its cultivated lands, is like its Egyptian prototype, a torrential stream, almost dry in some seasons, and in others swollen by cataracts in its northern portion. In flood periods it rushed through its canyons and valleys, sweeping all before it. It makes its course amid the snow-peaks of the continental divide. In southern Colorado, and thence in a southeasterly direction until it reaches the Texas-Mexico border, where it becomes the international boundary between the

two republics.

As the upper portion of the river basin in Colorado became settled, the farmers along the southern portion noticed a gradual diminution in their supply of water. The devastation of the Colorado forests by cutting and the annual fires, always resultant of the settlement of a new country, and the increasing demand on the water by the Colorado irrigators, caused an alarming decrease in the river's flow through New Mexico. Prior to 1885 the torrential spring floods had been of sufficient magnitude to furnish adequate water for this district, but in 1887 and 1888 the river was dry for periods of three months. On the other hand, after a long drought, cataracts occurring in the denuded northern mountains, would produce floods which, rushing over the sunken bed, would break the dam heads of the aqueducts and inundate the farms.

This fast was ruining the settlers of the fertile Mesilla valley of New Mexico, and they saw that to preserve their farms it was necessary to control and regulate the flow of the river by more enduring means than previously had been used. Therefore, about 1888, a company was formed at Las Cruces, the market town of the magnificent Mesilla valley, to erect dams and canals which might be of lasting benefit to the community. However, its labors were soon ended by the war department, because the canal had been surveyed through the military reservation of Fort Selden. The Mexican farmers along the right bank of the Rio Grande, being affected as their American neighbors, began to complain that they, likewise, were deprived of sufficient water, and the Mexican government presented a claim in their behalf for damages amounting to over \$25,000,000, and an international commission was appointed to investigate and report on the matter.

Farmers Organize.

In the meantime private interests were aroused by the deplorable conditions affecting the valley farms. In 1892 a company was formed at El Paso, Texas, for the purpose of constructing a storage dam a few miles north of that city, but its prospective prohibitive cost caused the project to be abandoned.

During the following year another company was incorporated as the Rio Grande Dam and Irrigation Company, for the purpose of impounding the river waters at Elephant Butte, Sierra County, New Mexico, some 70 miles north of Las Cruces, and of constructing a complete system of diversion dams and canals to regulate the flow of the river in the valleys below. This company was financed in England. Plans having been approved, the work was begun, but soon was terminated by the United States government instituting a suit in injunction on the plea that the river was a navigable stream.

It is unnecessary here to follow the progress of this celebrated case from one court to another until its final termination in 1899, when the supreme court declared the forfeiture of the company's charter.

In 1902 the passage of the reclamation act, with the consequent creation

of a bureau of the department of the interior, known as the reclamation service, took the matter of systematic irrigation projects, more or less, out of private hands into government control.

Among numerous projects claiming the attention of the bureau was that of the Rio Grande, and in February, 1905, congress passed an act providing for the construction of a storage dam near Elephant Butte, and the Mexican claims were settled by a convention signed at Washington May 21, 1906, and proclaimed January 16, 1907, whereby the United States agreed, after the completion of the new dam and its distributing system, to deliver to Mexico annually 60,000 acre feet of water, for which Mexico waived all claims for damages from diversion of the Rio Grande waters by American citizens.

Since the American users of the water to be impounded are obliged to pay for the construction of the system, congress, March 4, 1907, appropriated \$1,000,000 toward the construction of the Elephant Butte dam, equivalent to the proportional benefit which Mexico would derive from the project.

Magnitude of Project.

Briefly stated, the plan for the Rio Grande project contemplates the construction of a storage dam at the town of Cutler, N. M., and of four diversion dams and canals to be located respectively at the shade of Las Palomas, Rincon, Mesilla and El Paso, Texas.

Of those the Losingson dam has been constructed. This dam, built of concrete at a cost of \$269,000, is 600 feet long, has sluice and head gates and is connected by a canal six miles long with the old Dunn and Las Cruces and Mesilla ditch systems, irrigating some 100,000 acres in the Mesilla valley. Its construction was begun in November, 1908, and its use initiated with official ceremony February 12, 1909.

Although it was not until 1905 that congress passed its act authorizing the construction of the Elephant Butte dam in January, 1903, Arthur Powell Davis, assistant chief engineer of the reclamation service, having in the previous year made a reconnaissance of the Rio Grande valley, sent James A. French, a civil engineer, on a trip up the river to examine dam-sites in general and this one in particular. On receipt of a favorable report from Mr. French, surveys were begun, and B. M. Hall, supervising engineer in charge of the district of the Santa Fe southwest, began his plans for the construction of this enormous project.

While one may gain an excellent idea of the aims of the reclamation service by reading its elaborate and well-written annual reports, an actual visit to the location itself is by far the best means of grasping the magnitude of this undertaking. Leaving the train at the El Paso division of the Santa Fe railway at Cutler, N. M., one rides across some seven or eight miles of the flat prairie of the famous Jornada del Muerto (Journey of Death), which derived its gruesome appellation from the fact that the early pioneers who traveled the old

Santa Fe Trail, which bisects this level tableland, were apt to find death somewhere along its course from the hands of the hordes of hostile Apaches or from white bandits who infested the mountain ranges which form its sides.

The road takes a gradual ascent to the foothills of the Fra Cristobal, and, having passed through the gate of the Amendares grant, joins the government road and begins the descent of the river. The scene which meets the eye is beautiful. The clear blue sky seems to hang as a soft canopy over the somber mountains, which here and there present gorgeous purple and orange hues in the bright sunlight. Looking toward the river one sees a most irregular and broken country, mountain ranges separated by deep gorges and innumerable canyons from the midst of which rises the dark form of Elephant Butte.

Unlike the majority of natural objects whose shapes are supposed to be responsible for their names, no imaginative aids are requisite to discern the resemblance of this isolated peak to an elephant. So distinct is the outline of a monstrous pachyderm that one hardly believes that the huge form resting on the summit did not roam the region in antiquity, climb the surrounding hills, wallow in the river and finally die and become fossilized in its present position.

Leveling the Butte.

The butte is of volcanic formation and as rubble for the construction of the dam nothing could be more suitable than this accessible basalt rock. One stone crusher already has been established to reduce the shale. Many more will be added, so that, as the work progresses, the butte will gradually diminish until it finally be leveled, and on the completion of the dam, the site will be submerged in the depths of the reservoir.

While no actual masonry for the dam itself has been laid, preparations are well under way, and unless actual personal observation is possible it is difficult to appreciate the great task which these preliminaries constitute, and to realize the great natural obstacles which confront the engineers. For example, imagine the establishment of a camp supporting 2,000 persons, when all supplies must be hauled by wagon some 12 miles to afford the necessities of life, to say nothing of the accessories which make life bearable and enjoyable. Already a school has been established, in charge of a capable teacher, attended last season by some 30 pupils. Later blind halls, bowling alleys, concert rooms and other places of innocent amusement will be installed, every precaution to be taken to avoid the sale and distribution of liquor. In fact, everything practicable will be done to give a high morale to the laborers without infringing upon their personal liberties and individual pursuits. Such conditions are greatly facilitated by the withdrawal by the government of the surrounding land for a radius of some ten miles in all directions.

Preparations are being made for the employment of from 1,200 to 1,500 workmen. The majority of laborers will be Mexicans and the mechanics Americans. No Chinese will be em-

ployed, save as cooks and domestics. Section 4 of the reclamation act provides "that in all construction work eight hours shall constitute a day's work and no Mongolian labor shall be employed thereon."

Since it would be impossible to accomplish such an immense project without a railway, arrangements have been made with the Santa Fe railway by which a track has been laid from the damsite to the main line, forming a junction near Cutler.

Wells to furnish drinking water have been dug, and the river water for other domestic purposes is pumped into tanks, filtered and distributed by pipe lines throughout the camp. Although this river water is not particularly inviting in its natural condition, owing to its muddy color, it needs merely a sand filtering to remove the silt particles, which are stirred up from the river bottom by the current and held in solution until allowed to settle, when the water becomes clear and good.

Masonry of the Dam.

Completed, the main storage portion of the Rio Grande project at Elephant Butte will consist of a reinforced concrete rubble dam, faced with concrete blocks, on both sides, of the following dimensions:

Feet.

Length on top 400

Length at river surface 400

Width of roadway on top 135

Width of river bed 135

Height, bed rock to parapet 265

Height, river bed to flow line 184

Height, river bed to roadway 194

Batter upstream 7½-12

Batter up stream 12-20

Arch, up stream, radius 410,000

cubic yards.

This will require an excavation in the river bed of 200,000 cubic yards, and the use of 250,000 barrels of cement, taking 2,325 freight cars for shipment, or the equivalent of a train 15 miles long. There will be an outlet tunnel through the dam, containing immense steel regulating gates, controlled by hydraulic pressure, which will allow any needed quantity of water to pass through the river at any time desired.

The reservoir behind this enormous structure will be 35 miles long and an average width of 2½ miles. The capacity of the reservoir will be 2,350,000 acre feet, equaling 192,065,000 cubic feet, or 787,745,000,000 gallons; enough to flood the entire commonwealth of Massachusetts six inches deep.

From the dam in the head of the Mexican canal the ordinary river channel and its overflow will concentrate the waterway, and from this four canals will open at the four diversion dams to carry the water to the lands. The main canals and laterals will be constructed by the government; sub-laterals with their headgates by the water users, although the government engineers will survey and prescribe specifications, which must be adhered to on penalty of forfeiting the water rights. These also may be lost by failure to keep such portions of the system in good condition.

To Be a Paradise.

Upon the completion of the Rio

Grande project the valley land below Elephant Butte will constitute a veritable paradise for agriculturalists, who will be able absolutely to control their supply of water independently of rainfall. There will be no long periods of drought, no devastating floods, and the silt contained in the water will constantly renew and fertilize the soil. The drainage will be nearly perfect, since there is a slight inclination from the foothills to the river, and no artificial irrigation is necessary. Therefore there is no reason to doubt that in a few years the whole 18,000 acres to be irrigated from this system will be used to its full capacity, and that phenomenal crops of alfalfa, sugar beets, grapes, orchard fruits, garden vegetables, grains and nuts will be produced on what now is barren land.

Aside from the great benefits of irrigation a wonderful water power will be conserved at the big dam and at the four diversion dams. This power will be used to run electric dynamos, and to pump water upon the mesas adjacent to the valley lands. It is probable that the revenue derived by the water users' associations from these powers will pay all cost of maintaining the system, so that the users will obtain their water free and perhaps receive dividends on their shares.

Since no project of such magnitude ever is inaugurated without adverse comment, sometimes of the most ignorant character, there still are people who claim that the reclamation service plans are inferior to those of the private company. However, there is no doubt that the government engineers have made the most careful surveys, plans and estimates, and, to an impartial observer, they seem to be well nigh perfect. There is no praise great enough to bestow upon the engineering skill which can inaugurate and complete a project which will turn an arid, desolate and barren area into fertile land, covered with happy homes of prosperous American farmers.

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